

**“A Note on Access Pricing, Role Exchangeability and Incentives
to Invest”**

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“A Note on Access Pricing, Role Exchangeability and Incentives to Invest”

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Abstract:

The traditional Ramsey pricing and the Efficient Component Pricing Rule for access charges to a facility are modified in this paper, taking into account the constraint that profits per unit of investment must be the same between entrants and the incumbent (a general equilibrium requirement). It is shown that the required modifications are applicable even when the sustainability constraint is not operative. If this new condition is not satisfied, the incumbent will have an incentive to postpone the construction of the critical facility.

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1. Introduction.

The Access Pricing literature is an excellent example of applied microeconomics to regulatory economics and competition policy. The Efficient Component Pricing Rule is one main result of a literature that addresses the problem of determining prices of access of entrants to a network owned by an incumbent, with the objective of maximizing social welfare under a condition of sustainability of the provider of the facility.

There have been many elaborations and comments to the original Baumol-Sidak-Willig presentation, but we will discuss here a correction that seems to give the right incentives to invest in the long run.

We will add to the basic model the constraint that profits per unit of investment of the incumbent must be at least that of entrants'. Therefore, beyond the traditional sustainability condition of the provider of the essential facility, we will ask that the incumbent must not find preferable to be an entrant. The reason is that without this condition, builders of facilities will find attractive to postpone the construction and become pure entrants. Who would then provide the essential facility?

Next section is devoted to a very brief summary of references. Section 3 discuss the basic elements of the traditional approach. Section 4 addresses the role exchangeability condition, and we conclude with the main result in Section 5.

2. A brief summary of the literature

It is not our intention to present a detailed summary of this literature in this short note –in fact, the reader can find many good surveys-. For example, Valletti and Estache (1998) give a survey of different approaches and relevance of the problem. Laffont and Tirole (1996) suggested the use of “global-price-caps” considering access as a final good, not as an input; this allows to use Ramsey pricing with a cap on total revenues but without the need of knowing exact marginal costs of every activity. Crew and Kleindorfer (2002) have argued that the key weakness of the rule is in the evaluation of the opportunity cost in networks where a competitive fringe does not exist simply because there is an essential facility and the rule suffers from circularity. Vogelsang (2003) presents a summary and makes a distinction between “access” from “interconnection” and emphasizes the need of studying networks of similar hierarchy (like internet and not telephony). Valletti (2003) highlights the importance of examining incentives to investments.

3. A model used to develop the ECPR.

We will follow the presentation of Armstrong, Doyle and Vickers (1996) and use their model as our basic framework.

So let us assume that: 1) There is an essential facility that is necessary to reach customers with a final product; this essential facility is a natural monopoly, a private network or transmission system (for example, providers of telephone cellular phones need the fixed line phones to complete calls). 2) The owner of the facility is also a producer of the final

product, and struggles with a competitive fringe in that market (the incumbent works in both markets). Therefore the problem we address here is to determine access prices to the network in such a way that total welfare is maximized. High access prices will cover the costs of investment in the network but will discourage entry of firms in the competitive fringe, while low prices will create competition in the market of the final product, but they will eventually eliminate the incentives to invest in the network (a sunk cost ex post).

For the sake of simplicity, let us suppose there are only two firms: an incumbent and an entrant. Firm I is the owner of the facility while E is the entrant ; this firm requires one unit of network services (« access »). The original model assumes that there are no fixed costs for entry. Let $\xi(q, s)$ be the cost for I of selling q units of its own production in the final market and s units of access served to E and $x(P)$ the demand function for the final product.

Profits of firm E are given by

$$(P - a)s - c(s) + f$$

where P is the price of the final product and a is the price of one unit of access and $c(s)$ the entrants' cost of producing s units, while f are the investment costs necessary to be an entrant.

Notice that the difference here from the traditional presentation is that we are assuming that f is not zero. This is necessary for our results, but we can make these costs as small as we wish; f are not costs of access to the network.

Profit maximization conditions require:

$$P - a = m = c'(s)$$

with $c''(s) > 0$ and therefore the supply function of E depends on prices net of access costs:

$$s^* = s(m)$$

Profits of the incumbent I can be written as:

$$Px(P) - ms(m) - \xi(x(p) - s(m), s(m)) - F$$

There are two sources of revenue for the firm. On the one hand it could charge an amount as to give entrants access to the facility. On the other, they could sell its own units to the market with a revenue $P(x-s)$. We have included here costs of investment in the facility, given by F .

The sustainability condition is therefore:

$$(S) \quad Px(P) - ms(m) - \xi(x(p) - s(m), s(m)) - F \geq 0$$

Social welfare maximization requires to maximize customers surplus in monetary terms

$$u(x(P)) - px(P)$$

plus profits of entrants and incumbents, subject to non negativity of profits of incumbents (the constraint imposed by the requirement of sustainability of the natural monopoly). Notice that entrants profits will be always positive if f is small enough. Variables of choice are P and m . Let us call λ the multiplier associated to the incumbents profits non-negativity condition. Optimal prices will be given by:

$$\begin{aligned} P - \xi_1 / P &= \theta / \eta_x \\ (GE) \quad m - (\xi_1 - \xi_2) / m &= -\theta / \eta_s \end{aligned}$$

where $\theta = \lambda / (1 + \lambda)$, and η_x and η_s are the demand elasticity for the final product and the supply elasticity of entrants (both positive).

We can see that this equations are Ramsey prices that take into account the elasticity of demand for the final product and the intensity of the revenue constraint to cover the cost of the transmission facility.

There are several cases obtained under different assumptions.

Firstly, let us assume that I is not a Natural Monopoly (i.e. $\theta = 0$), then:

$$\begin{aligned} P &= \xi_1 \\ a &= \xi_2 \end{aligned}$$

We can pose, instead, that if I is a natural monopoly and the condition is binding ($\theta > 0$) we will get:

$$\begin{aligned} P &> \xi_1 \\ a &> \xi_2 \end{aligned}$$

Hence, prices will exceed marginal costs simply because it is necessary to cover costs of the facility and not due to monopoly power (the monopolistic solution can be obtained by letting $\lambda \rightarrow \infty$).

Third, when P is determined by the regulator exogenously, i.e. P is not longer a variable to be used in the optimization process, and $\theta = 0$ the outcome will become:

$$a = \xi_2 + P - \xi_1.$$

The first term of the second hand is the direct cost of providing access to an entrant, while the second term is the foregone profit or opportunity cost of the foregone market due to admitting access by competitors. This equation is the basic Efficient Component Pricing Rule.

Thus the main lesson is that efficiency requires that incumbent charges himself the same cost for the use of the network that is imposed to entrants.

4. The case without role lock-in.

Let us consider now how we should adapt the above analysis for the case of role exchangeability. This means that profits per unit of investment should be the same for entrants and for the incumbent. If these rates of profit were different, it could be impossible to disregard situations where the incumbent could postpone investments simply because it is more profitable to be an entrant. Notice that the presentation by Armstrong et al (1996) assumes that profits of entrants are always positive while (in the same framework) to guarantee that result for the incumbent requires to impose a constraint on welfare maximization.

Moreover, there is nothing that rules out cases where F is not enough to compensate the differences in the respective profits per unit of investment.

So, let us reconsider the problem of welfare maximization when the following constraint is imposed:

$$[Px(P) - ms - \xi] / F = (ms - c) / f$$

that is, the rate of profits –in our sense- per unit of capital invested must be equal. This is what we call the Role Exchangeability (RE) condition, which can be written as:

$$(RE) \quad [Px(P) - ms - \xi](f / F) - ms + c = 0$$

Let $\delta = f/F$ and φ be the multiplier associated to this last constraint. Then welfare maximization with respect to P and m gives:

$$P - \xi_1 / P = (\lambda + \varphi\delta / 1 + \lambda + \varphi\delta)(1 / \eta_x)$$

$$m - (\xi_1 - \xi_2) / m = (\varphi + \delta\varphi + \lambda / 1 + \lambda + \varphi\delta)(-1 / \eta_s)$$

Notice that if the condition of exchangeability is relaxed (i.e. $\varphi = 0$) we will obtain the same conditions we already had for the traditional case.

But on the other hand, even if δ is small, the condition on m will be different if profit rates are different; that is, even if entrants are not risking capital, it will be necessary to extract part of their rent to finance the network so that incentives to invest will be leveled.

As in the traditional model, it is possible to distinguish several special cases:

- a) (S) is operative but (RE) is not binding. In this case we go back to the traditional solution for $\lambda \geq 0$ and $\varphi = 0$.
- b) (S) is not binding, but (RE) is operative, with $\lambda = 0$ and $\varphi > 0$ (though it is not possible to discard $\varphi = 0$).
- c) (S) and (RE) are both operative, with $\lambda > 0$ and $\varphi > 0$.
- d) Neither (S) nor (RE) are operative.

The most interesting situations are b) and c). In both cases, access pricing is modified due to the presence of (RE); for example, take b) and assume that profits are enough to guarantee sustainability, but that does not mean that profits of the incumbent will be comparable on the same grounds with those of the entrants'. Therefore, access prices will have to be corrected upwards, and that will impact also on prices for the final product:

$$P - \xi_1 / P = (\varphi\delta / 1 + \varphi\delta)(1 / \eta_x)$$

$$m - (\xi_1 - \xi_2) / m = (\varphi + \delta\varphi / 1 + \varphi\delta)(-1 / \eta_s)$$

The first equation says that even if condition (S) is not operative, prices will be increased over marginal costs, for it is necessary to have the same rate of profit in every segment of the market (except when entrants do not have fixed costs, i.e. $f = 0$). The second equation, says that entrants' net prices will be modified to increase the rate of profit of the incumbent (and that will happen even if $f = 0$, i.e. $\delta = 0$; in fact, in this second case we will have $a = \xi_2 + \varphi / \eta_s$).

And now the expression for the ECPR will be put as:

$$a = [P + (\xi_2 - \xi_1) / (1 + \phi / \eta_s)]$$

where $\phi = (\varphi + \delta\varphi) / (1 + \varphi\delta)$.

This implies that access price should be corrected. Let us put it in terms of the marginal cost and of the opportunity cost:

$$a = \xi_2 / (1 + \phi / \eta_s) + [P - (\xi_1 / (1 + \phi / \eta_s))]$$

The marginal costs of entrants will be reduced since it is preferable to dispatch less units of the incumbent and more of the entrants; this will reduce total costs for the incumbent.

But at the same time, it will be necessary to compensate the loss of profits of the incumbent due to additional sales of the entrants, and hence the opportunity cost of each unit must be increased.

The net effect will be positive if $\xi_2 < \xi_1$; if marginal costs of entrants is lower then access prices will be increased to compensate the differences in profits.

5. Concluding remarks.

There is an increasing interest in pricing rules for networks and for taking into account investment in those networks. Access conditions to railroads and telecommunications, for example, are critical for investment decisions in those infrastructure services. However most of the literature focuses more on treatment of entrants than on the incentives (explicit or implicit) given to incumbents for expanding capacity (an exception being Valletti (2003)).

The main result of this note is that the traditional sustainability condition is not enough to discuss all the incentives to invest in a network facility. It asks for access prices that cover fixed costs but not for leveling profits per unit of investment between entrants and incumbent. Who would like to be an incumbent in an industry (or provide the facilities) if it were possible to fraction capital and get a higher rate of return on every piece? The “Role Exchangeability Condition” is a general equilibrium requirement to be imposed in industrial regulations. And when we take into account this role indifference (long run) condition, the Ramsey access prices and the ECPR must be modified.

Therefore, if there is mobility of agents between different roles, it will be necessary to make a correction of the traditional formulas for access pricing. This corollary seems to go beyond the problem of access pricing, and could also be relevant for cases of Ramsey pricing when agents have more than one possible role in the market.

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